AMENDMENTS TO THE DRAWINGS

Six replacement drawing sheets have been filed herewith, wherein the replacement drawings remove the informalities noted by the Draftsperson on the form PTO-948 as sent with the October 26 Office Action.

Attachment: Six (6) Replacement Drawing Sheets (including Figs. 1-7).

REMARKS

Claims 1-7 are all the claims pending in the application. Claims 3-6 have been withdrawn from consideration by the Examiner. Claim 7 has been added. Reconsideration and allowance of all the claims are respectfully requested in view of the following remarks.

Drawings

The Examiner objected to the drawings for the reasons set forth by the Draftsperson on the form PTO-892 as mailed with the October 26 Office Action. Applicants have submitted herewith formal drawings believed to overcome this objection.

Claim Rejections - 35 U.S.C. § 112

The Examiner rejected claims 1 and 2 under §112, 2nd paragraph, as indefinite. Specifically, the Examiner took issue with the phases "a large number" of rolling elements, and "said raceway groove" as set forth on line 13. Applicant has amended these phrases in a manner believed to overcome this rejection. Namely, "a large number" has been amended to --a plurality--, and "said raceway groove" has been amended to --said first or second raceway groove--.

Claim Rejections - 35 U.S.C. § 102

The Examiner rejected claim 1 under §102(b) as being anticipated by US Patent 6,210,039 to Teramachi (hereinafter Teramachi). Applicant respectfully traverses this rejection because Teramachi fails to disclose every element as set forth and arranged in the claims.

Claim 1 sets forth a linear guide comprising a guide rail having a first raceway groove, and a slider having a second raceway groove, wherein a depth Dg of said first or second raceway groove is set so that a ball diameter ratio (Dg/Dw) obtained by dividing the depth Dg by a diameter Dw of a rolling element ranges from 0.26 to 0.45.

Applicant's claimed ball diameter ratio is specifically defined in order to address the problems involved in forming the raceways of a linear guide device by rolling.

More specifically, in the prior technique of forming raceway grooves by rolling, the shape of each of the raceway grooves, which is transferred to a rail blank material, includes an error due to springback with respect to the shape to be formed by the rotary die. The shape of each of the grooves is further changed by being heat-treated. For example, such an error and variation thereof tends to increase as a processed amount (that is, cost of processing) increases. See, for example, page 2, lines 1-18.

When such an error and variation thereof occur in the shape of the raceway groove, the contact angle between the raceway groove and a rolling element does not have a targeted value. This affects the load capacity of the linear guide device, and results in reduction of stiffness thereof, and thus in decrease of the lifetime thereof. (Specification at page 2, lines 19-24)

When the processed amount is decreased, that is, the depth of the raceway groove is set to be too shallow so as to reduce the error, a contact ellipse formed in a contact portion between the raceway groove and the rolling element is broken in the middle thereof. Consequently, a contact surface pressure becomes locally excessively large. This results in early damage in the apparatus. (Specification at page 2, line 25 - page 3, line 6)

Accordingly, an object of the application is to provide a linear guide device enabled to ensure processing accuracy needed for satisfactorily performing a bearing function in the case of forming raceway grooves in a guide rail and a slider by rolling, and also enabled to have practically sufficient load capacity. (Specification at page 3, lines 9-15) This is achieved, at least in part, by designing a linear guide device that may be formed by rolling that has one of a raceway groove in the guide rail and the raceway groove in the slider of a depth such that a ball diameter ratio (obtained by dividing the depth of the raceway groove by the diameter of the rolling element) ranges from 0.26 to 0.45. (Specification at page 3, line 17 - page 4, line 5. See, also, page 4, line 16 - page 5, line 2)

Thus, even when a rolled amount is large, an error in shape of the groove is restricted within a certain range by setting the value of the depth of the groove so that the ball diameter

ratio is equal to or less than 0.45. For a more detailed description of how the inventors determined the upper limit of the ball diameter ratio, 0.45, see the specification at page 13, line 10 - page 15, line 15. On the other hand, even when the depth of the groove is small, load capacity enough for practical use is realized by setting the value of the depth of the groove so that the ball diameter ratio is equal to or more than 0.26. (Specification at page 5, lines 3-10) For a more detailed description of how the inventors determined the lower limit of the ball diameter ratio, 0.26, see the specification at page 15, line 16 - page 17, line 9.

Consequently, according to the application, due to the ball diameter ratio as found by the inventors, there can be provided a linear guide device enabled to reduce processing time, which is taken by rolling raceway grooves, to decrease the cost, to ensure processing accuracy needed for satisfactorily performing functions of the apparatus, and to have a load capacity sufficient for practical use. (Specification at page 17, lines 10-22. See, also, page 18, lines 14-21.)

In contrast to that set forth in claim 1, Teramachi only broadly sets forth a groove depth of approximately 1/3 to 1/2 of a diameter of the rolling ball, i.e., a ball diameter ratio of approximately 0.33 to 0.50. See, for example, Teramachi at: abstract, last four lines; col. 2, lines 35-38; and col. 8, lines 44-48. However, Teramachi fails to disclose any one specific point within Applicant's claimed range, because the disclosure of the end points of a range is not a specific disclosure of a value sufficient to anticipate a claimed range. See, for example: *Atofina v. Great Lakes Chemical Corp.*, 78 USPQ2d 1417 (Fed. Cir. 2006); and MPEP §2131.03(II). Further Teramachi's range of 0.33 to 0.5 does not disclose the claimed range of 0.26 to 0.45 with sufficient specificity. Similar to the situation in *Atofina*, Teramachi's broadly claimed range of "approximately 1/3 to 1/2" fails to disclose with sufficient specificity, Applicant's specifically defined range of 0.26 to 0.45

Accordingly, in light of the above, Teramachi fails to anticipate claim 1.

Claim Rejections - 35 U.S.C. § 103

The Examiner rejected claim 2 under §103(a) as being unpatentable over Teramachi in view of US Patent 6,620,262 to Okita et al. (hereinafter Okita). Applicant respectfully traverses this rejection.

As noted above, Teramachi is deficient. The Examiner relies on Okita as teaching removal of a decarburized layer from a bearing race. However, the Examiner fails to specifically set forth how Okita cures the above-noted deficiency in Teramachi. Accordingly, this rejection is deficient, and Applicant respectfully requests that the Examiner withdraw it.

New Claim

New claim 7 has been added. Claim 7 sets forth that the race is formed as a Gothic arch. In contrast to that set forth in claim 7, Teramachi discloses ball rolling grooves that have a "circular-arc-shape". See, for example, Teramachi's abstract, last four lines.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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